

NOTES ON THE PHYLOGENY OF THE NEARCTIC TETHINIDAE
AND A REVIEW OF THE GENUS NEOPELOMYIA HENDEL
AND THE TETHINA MILICHIoidES GROUP (DIPTERA)¹

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ABSTRACT—The Nearctic genera of the family Tethinidae are keyed and their phylogenetic relationships diagrammed. The genus *Phycomyza* Melander is made a junior synonym of *Tethina* Haliday and its species treated as the *milichioides* species group. The *milichioides* group and *Neopelomyia* Hendel are reviewed with 3 new species described: *Tethina woodi*, *T. steyskali*, and *N. longicerca*. The male genitalia of each group is discussed and figured in detail and species keys for each group are presented.

The family Tethinidae in North America previously consisted of 22 described species in five genera. The present study increases the number of species to 25 while decreasing the number of valid genera to four.

Most Tethinidae can be found in relatively large numbers on ocean beaches and can be collected by sweeping beach grasses, rotting seaweed or algae, or directly on sand. Haliday (1838) and Sturtevant (1923) record *Tethina illota* Haliday, a European species, on flowers of *Cakile maritima* (sea-rock, Cruciferae) and *Convolvulus soldanella* (bindweed, Convolvulaceae). Other species are found in salt marshes or inland alkaline lakes. A few of the more primitive species are not halophilic. *Pelomyia coronata* Loew, for example, has been recorded by Melander (1952) from "lush forests, meadowlands, and in the desert."

The immature stages of Tethinidae are completely unknown to date. Judging by the habitats, however, it is likely that the larvae of most species are saprophagous (Malloch, 1934), feeding on decaying algae and seaweed. For additional habitat and distributional data, as well as a taxonomic history of the family, see Melander (1952).

Most tethinids are easily recognized by their white or gray pollinose body, wide cheeks and often, whitish wings with dark veins. They are distinguished from other acalyptrate flies by the incomplete subcosta, costal break near end of R₁, convergent postverticals, outwardly directed or reclinate upper fronto-orbitals, distinct oral vibrissae, 1 or 2 presutural dorsocentral bristles and the lack of apical tibial bristles (Melander, 1952).

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The following key is based on Melander (1952) and Sabrosky (unpublished key).

1. Cheek bare except for peristomal row of bristles; face with small shiny tubercle above each vibrissa; humerus with several scattered bristles; male surstylus fused with epandrium, located ventrally Tethinae, *Tethina*.....2
- Cheek with scattered hairs; face without tubercles; humerus with only 1 or 2 strong bristles; male surstylus located more dorsally and not fused with epandrium Pelomyiinae.....3
2. Head relatively elongate (fig. 9, 10, 11); face short, $\frac{1}{3}$ as long as front, deeply concave with strong median carina; antenna decumbent and turned laterally, exposing mesal surface; labellum as long as head; (wet sand zone species) *Tethina milichioides* group
- Head short; face usually longer, not deeply concave; antenna porrect; labellum not as long as head; (dry sand zone species)*Tethina* (s.s.)
3. Vibrissal angle projecting (fig. 17); eye oblique; orbitals 3 pairs
.....*Neopelomyia*
- Vibrissal angle not projecting; eye rounded; orbitals 1 or 2 pairs 4
4. Orbitals 2 pairs; aerostichals absent; face and peristome without shining chitinous stripe*Pelomyiella*
- Orbitals 1 pair; few aerostichals present; face below with 2 narrow shining stripes, each continuous with shining peristomal ridge*Pelomyia*

PHYLOGENETIC ANALYSIS OF THE NORTH AMERICAN GENERA

The phylogenetic relationships of the North American tethinid genera and those within the genus *Tethina* Haliday are shown in Diagram 1. This phylogeny is tentative as much data are still to be obtained on certain character complexes, such as the male genitalia and the immature stages. Previous work on the family has relied mostly on the external adult characters.

The species examined in the analysis were: *Pelomyia coronata* Loew, *Pelomyiella mallochii* Sturtevant, *P. melanderi* Sturtevant, *Neopelomyia rostrata* (Hendel), *N. longicerca* Foster, *Tethina illota* Haliday, *T. parvula* Loew, *T. horripilans* (Melander), *T. albula* Loew, *T. steyskali* Foster, *T. woodi* Foster, *T. milichioides* (Melander), and *T. angustifrons* Melander.

The numbers appearing in Diagram 1 correspond to the following synapomorphic character states:

- 1—Those given in the groundplan of Tethinidae (see Griffiths, 1972).
- 2—Labellum long; shiny facial tubercle present; cheek with peristomal row of bristles only.
- 3—Dry sand zone inhabiting; epiphallus oblong.
- 4—Arms of hypandrium separated anteriorly.
- 5—Postgonites 2-branched posteriorly; no antennal concavities; head about as high as long; epistome not developed.
- 6—Tip of distiphallus long tapered; cercus recurved and pointed.

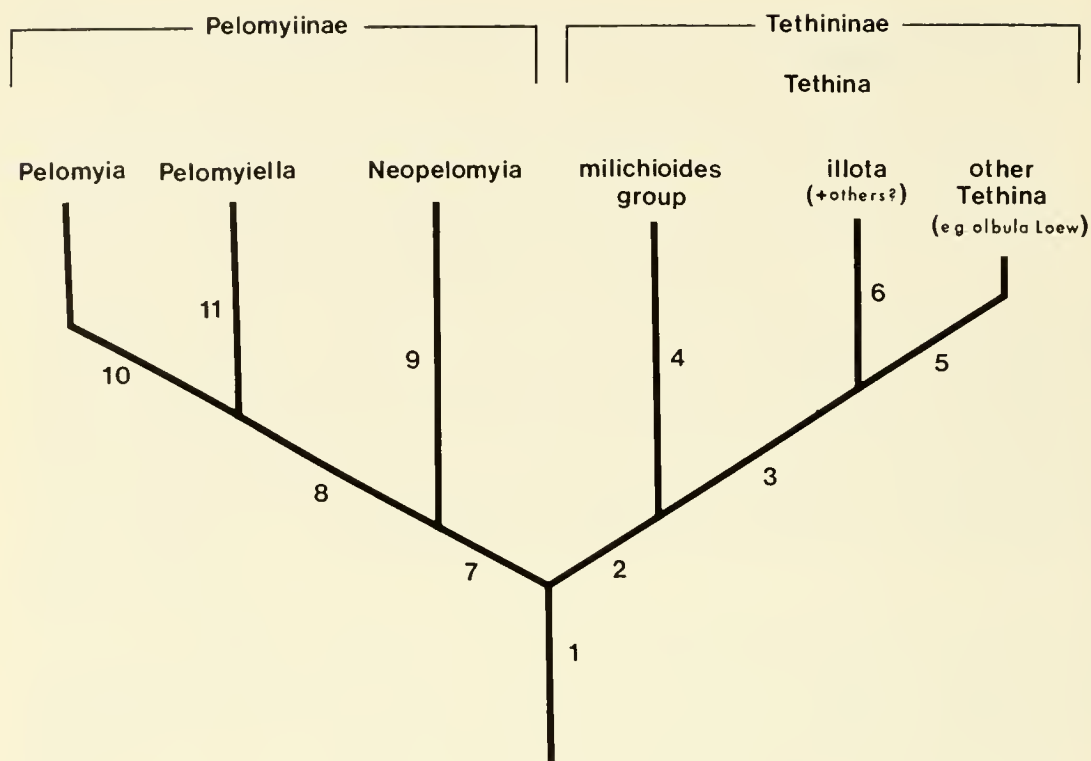


Diagram 1. Phylogenetic relationships of North American tethinid genera and of the species groups of *Tethina* Haliday. See text for explanation of numbers.

- 7—Surstylus separated from epandrium and located as much dorsally as cercus; 2nd basal cell fused with discal; interfrontals reduced or absent; hind tibia without apical spine.
- 8—1 or 2 pairs of orbitals; face narrow; acrostichals absent or reduced.
- 9—Vibrissal angle projecting; labellum elongate; strictly halophilic species.
- 10—Oral and facial margin with shining chitinous stripe; 1 pair of orbitals.
- 11—Tip of distiphallus long tapered.

Genus *Tethina* Haliday

Opomyza, subgenus *Tethina* Haliday 1838:188. Type-species, *illota* Haliday, original designation.

Phycomyza Melander 1952:198. Type-species, *Rhinoessa milichioides* Melander, original designation. (NEW SYNONYM.)

Rhinoessa Loew 1862:174. Type-species, *cinerea* Loew (by monotypy) = *grisea* (Fallén).

The basic groundplan of the genus *Tethina* includes the following character states: labellum as long as head (apomorphic); shining facial tubercle (apo-); cheek with peristomal row of bristles only (apo-); lobes of epiphallus separated (plesiomorphic); surstylus fused with epandrium and in a ventral position (plesio-); hind tibia with apical spine (plesio-); inner orbital row of bristles present and well developed (plesio-); orbitals greater than 6 in number (plesio-); interfrontals present and well developed (plesio-); 2nd basal cell separated from discal cell (plesio-).

The sister-group of *Tethina* is clearly the subfamily Pelomyiinae which includes three genera: *Pelomyia* Williston, *Pelomyiella* Hendel, and *Neopelomyia* Hendel (Diagram 1).

The genus *Phycomyza* was erected by Melander (1952) for *Rhinoessa milichioides* Melander (1913). However, the characters which Melander considered to be of generic importance, namely the shortened face, protruding epistome, sunken antennae, elongated head, 5 pairs of short interfrontal bristles and elongated labellum are also present in *illota* Haliday, the type-species of *Tethina*. There are a few differences in the male genitalia between the two species but these I believe do not constitute sufficient grounds for the generic separation of *milichioides* from *illota*.

To make certain of the synonymy of *Phycomyza* and *Tethina* the male genitalia of several species were examined. These included: *Tethina milichioides* (Melander), *T. illota* Haliday, *T. albula* Loew, and an apparently undescribed species near *albula*. I arrived at the right $\frac{1}{2}$ of the cladogram shown in Diagram 1 from the observation of several morphoclines in some of the postabdominal structures, 1.) the aedeagal apodeme ranges from a strong posterior curvature with a pointed posterior tip in *milichioides* through slightly curved and blunt tipped in *illota* to straight and blunt in *albula*, 2.) the postgonites range from relatively thick structures, approximately 40° angle ventrally to the aedeagal apodeme in *milichioides* through a smaller angle to the aedeagal apodeme but still thick in *illota* to almost parallel with the aedeagal apodeme, thinner, and 2-branched in *albula*, 3.) the shape of the hypandrium in lateral view ranges from thick and stout, with the lateral lobes well developed in *milichioides* through thinner and longer, with no lateral lobes in *illota* to even thinner in *albula* and also without lobes, 4.) the hypandrial arms go from separate anteriorly in *milichioides* to fused in both *illota* and *albula*, 5.) the epiphallus ranges from wide and saclike with granular surfaced anterolateral lobes in *milichioides* through more derived, oblong, tapering to a point posteriorly (similar to *Neopelomyia*) in *illota* to much less obvious in *albula* and oblong-tapered.

The above morphoclines indicate to me, as shown in the cladogram, that the species of the *milichioides* group are merely plesiomorphic species of *Tethina*.

Tethina milichioides group

Phycomyza Melander 1952:198. Type-species, *Rhinoessa milichioides* Melander 1913:299 (original designation).

Body pollinose; all bristles black. Head: Generally prognathous; antenna decumbent, turned laterally, exposing mesal surface, about $\frac{2}{3}$ as long as face; arista dark at basal and distal $\frac{1}{4}$, middle section lighter in color, slightly longer than width of 3rd antennal segment, pubescent; 3rd segment round; 2nd segment

with several short, black bristles and 1 longer; 1st segment short, with 1 short bristle dorsally; face short, .4-.5 eye height, concave with median carina; epistome gray, sharply contrasting with yellow face, with conspicuous knob in center projecting farther anteriorly than antenna; vibrissa as long as antenna with small shining tubercle above; frons anteriorly yellow to orange or gray with margins convergent; frontal orbit, ocellar triangle, and occiput light gray, pollinose; cruciate interfrontals 4 pairs; orbit with 2 rows of bristles: inner row of 4-6 (usually 5) inclinate bristles, all shorter than outers, outer row of 5 reclinate-divergent bristles; ocellars strong, proclinate-divergent; ocellar triangle with several short bristles in addition to ocellars; postverticals short, less than $\frac{1}{2}$ length of inner verticals, convergent; inner verticals strong, convergent; outer verticals strong, divergent; cheek .4-.5 eye height, anterior $\frac{2}{3}$ yellowish or whitish, posterior $\frac{1}{3}$ concolorous with occiput; peristome with row of 5 dorsally curved bristles, posterior-most bristle directed anteroventrally; eye oval, oblique, with anterior facets larger than others; proboscis long, slender, geniculate, labellum as long as middle section of mouthparts and lighter in color; palpus yellowish to whitish.

Thorax: Entirely gray pollinose. Bristles: dc 4, presutural 1, postsutural 3; acrostichal short, in 4 irregular rows; humeral 1 strong and several shorter; presutural 1; notopleural 2; supraalar 1; postalar 2; scutellum with 4 marginals—apical, 2 lateral; propleural 2, located just above fore coxa; mesopleural 1 row of several strong bristles along posterior margin, several shorter bristles scattered over surface; pteropleural none; sternopleural 1 or 2 strong, several scattered shorter ones. Halter whitish to yellowish. Legs: Bristly, entirely pollinose except hind femur polished on posterior surface; fore tibia posteriorly with many short, white hairs on distal $\frac{1}{2}$ in addition to black bristles; fore and hind basitarsi posteriorly with mat of short white hairs; all basitarsi yellow; 2nd segment varying from yellow to brown, last 3 segments darker; Wing: Veins yellowish; membrane white to hyaline; costa with short black setulae and broken just before end of R₁; anal vein absent.

Abdomen: Gray pollinose, terga with posterior edges white; male genitalia with surstylus spatulate to backwardly curved; lateral process of hypandrium projecting or rounded (see further discussion below).

Ecology and Distribution: Wet sand zone of ocean beaches of western coasts of North America.

Characters of Phylogenetic Importance: The autapomorphic character state of the *milichioides* group is the anterior separation of the arms of the hypandrium.

CHARACTERS OF THE MALE POSTABDOMEN OF THE *milichioides* GROUP

Epandrium: The epandrium of the *milichioides* group is a simple inverted U-shaped structure with several strong bristles on its exterior surface both dorsally and laterally (fig. 1 Epa). The cerci are simple, pubescent lobes with several strong hairs on their surface in addition to the pubescence (fig. 1 Ce). The surstyli, as in all *Tethina*, occupy a ventral position on the epandrium and are fused with it (fig. 1 Sur). In lateral view they are simple spatulate lobes and in posterior view are boot shaped and turned mesally with the heel directed

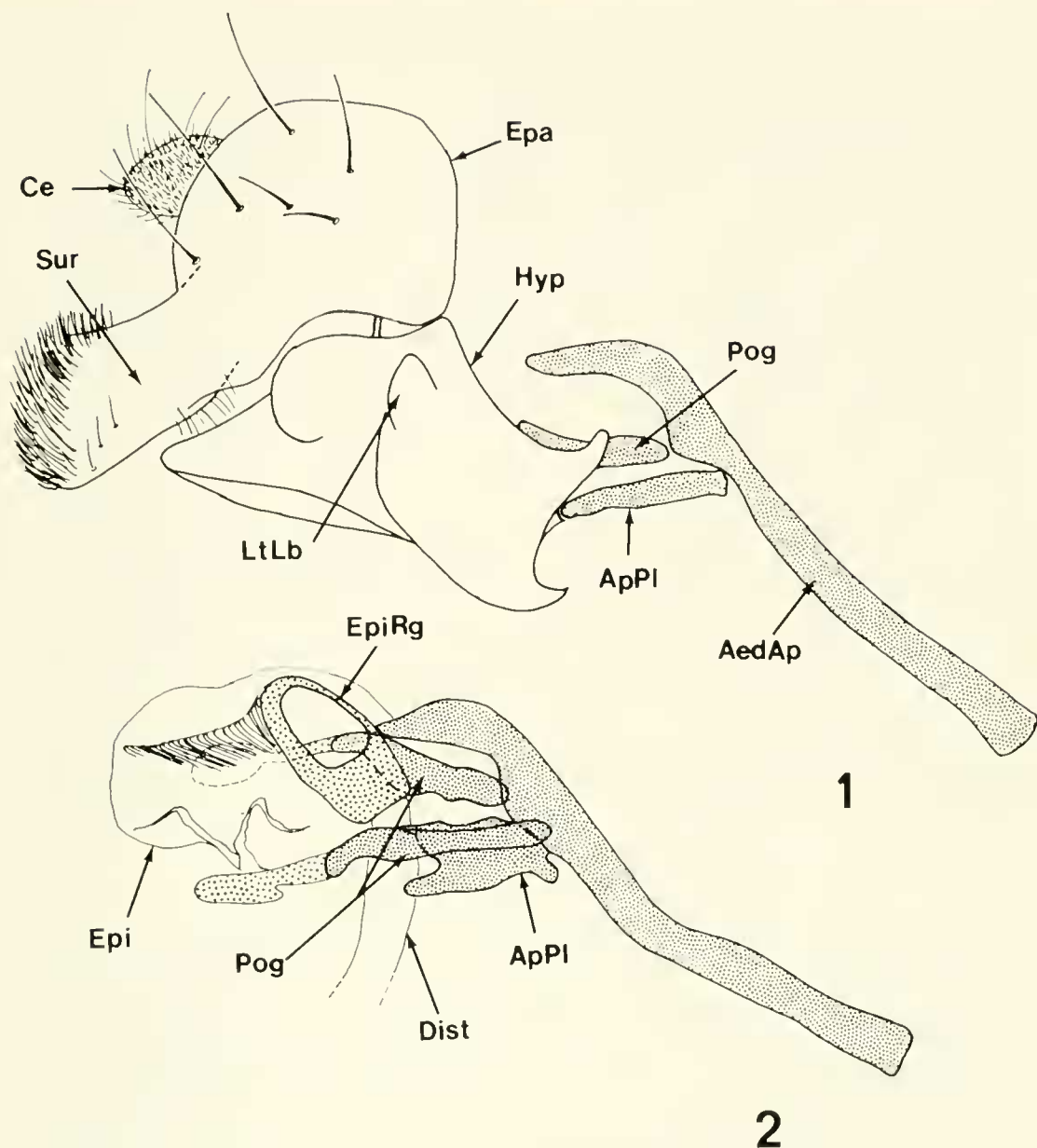


Fig. 1-2. Male genitalia of *Tethina milichioides*. 1, lateral view of entire structure. 2, dorsal oblique view of inner copulatory apparatus.

dorsally. They have many black hairs on the posterior edge, and on the mesal and lateral surfaces. The surstyli, while being fused with the epandrium, are also continuous mesally with the interparameral sclerite (Griffiths' term, 1972) which is located at about the same position dorsally as the cerci. The interparameral sclerite is an H-shaped sclerotized structure within the epandrium which articulates with the hypandrium.

Hypandrium (fig. 1, 6-8): The hypandrium consists basically of 2 arms fused at the posterior ends, a situation which is opposite of that in *Neopelomyia* Hendel, as discussed below. Between the 2 arms is an open space through which the distiphallus issues forth and is allowed to swing through a wide arc. Each arm has a lateral lobe which is variously developed in the 3 species of the *milichioides* group. These lobes originate at about the middle of the lateral wall of each arm.

Inner Copulatory Apparatus and Distiphallus (fig. 2): The inner copulatory apparatus is a complex structure composed of a long, rodlike, highly sclerotized aedeagal apodeme which is posteroventrally curved; a broad saclike epiphallus, the dorsal surface of which contains a partially sclerotized ring (which I am designating the *epiphallic ring*); a pair of postgonites located to each side of the aedeagal apodeme; and finally a broad, sclerotized plate anterior to the epiphallus.

The epiphallus is primarily a saclike membrane with 2 granular surfaced lobes on the anterolateral portions where the postgonites meet the epiphallus (the granular surface is not shown in the figure). In a ventral view of the hypandrium in an undissected specimen these granular lobes appear as 2 pubescent spheres connected to the posterior ends of the postgonites, but removal of the inner copulatory apparatus (effected by a gentle tug on the aedeagal apodeme) reveals the true situation.

The 2 postgonites articulate with the aedeagal apodeme and fuse with the epiphallus. At the point of fusion with the epiphallus they continue posteriorly as partially sclerotized spatulate structures. The sclerotized plate, which I will call the apodeme plate, is fused with the aedeagal apodeme at a point dorsal to the anterior edge of the hypandrium. The apodeme plate articulates with the anterior edges of each arm of the hypandrium. The aedeagal apodeme itself lies free in the abdominal cavity.

The distiphallus consists of a long, slender, flexible tube with long, dense hairs on the dorsal surface. The hairs extend about $\frac{2}{3}$ of the length of the distiphallus which originates at the epiphallic ring.

KEY TO THE SPECIES OF THE MILICHIODES GROUP

1. Head prognathous in appearance as in fig. 9, 10; cheek white to yellowish; male genitalia: hypandrium in ventral view as in fig. 6, 7; lateral lobe of hypandrium not large and protruding 2
- Head not prognathous (fig. 11); cheek yellow to brownish; male genitalia: hypandrium in ventral view as in fig. 8; lateral lobe of hypandrium very conspicuous and protruding posteriorly; surstylus in lateral view somewhat curved posteriorly (fig. 5) *T. milichioides* (Melander)
2. Cheek yellowish to brownish; larger species—2.5 mm; male genitalia: hypandrium in ventral view as in fig. 6; surstylus in lateral view not curved posteriorly, spatulate (fig. 3) *T. woodi* new species
- Cheek distinctly white; smaller species—1.8 mm; male genitalia: hypandrium in ventral view as in fig. 7; surstylus in lateral view somewhat curved posteriorly (fig. 4) *T. steyskali* new species

Tethina woodi Foster, new species

fig. 3, 6, 9

Male: Length: Body 2.5 mm (2.4 mm–3 mm); wing: 2 mm.

As in *milichioides* group description except: Head: 1.12 longer than high; 3rd antennal segment black to gray except basal $\frac{1}{3}$ dark orange; 2nd segment mostly orange, gray in area of bristles; 1st segment orange; face .52 times eye height; frons orange anteriorly, becoming brown to gray posteriorly; ocellars broken off

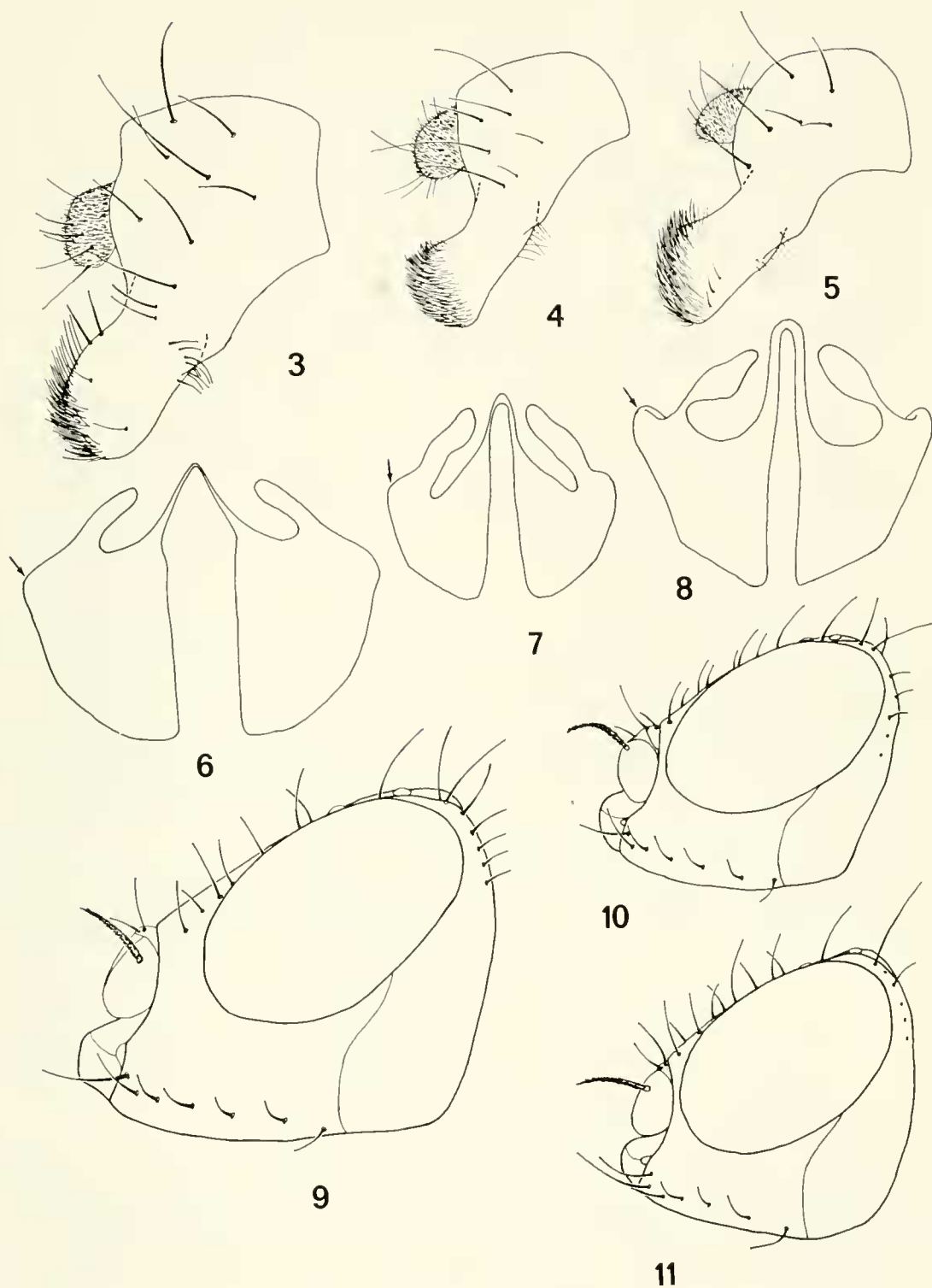


Fig. 3-5. Epandria and surstyli, lateral view. 3, *Tethina woodi*. 4, *T. steyskali*. 5, *T. milichioides*. Fig. 6-8. Hypandria, ventral view (arrows indicate lateral lobe). 6, *T. woodi*. 7, *T. steyskali*. 8, *T. milichioides*. Fig. 9-11. Heads, lateral view. 9, *T. woodi*. 10, *T. steyskali*. 11, *T. milichioides*.

in holotype; cheek .52 times eye height, yellowish on anterior $\frac{2}{3}$; holotype with 1 extra peristomal bristle between and slightly above 3rd and 4th bristles on left side; palpus yellow.

Thorax: Halter whitish. Legs: Mid-tarsus yellow through 2nd segment. Wing: Membrane white.

Abdomen: Male genitalia: Surstylus spatulate, not curved posteriorly; hypandrium with lateral lobes rounded, not projecting.

Female: Length: 2.4 mm–3 mm. Similar to male, except for postabdominal characteristics.

Holotype: ♂, Ilwaco, Washington, 12 July 1922, A.L. Melander, coll. No. 73640, USNM.

Paratypes: 19♂ 10♀, as follows: California: San Francisco, 22 June 1947, A.L. Melander, 5♂ 7♀; Seal Beach, 26 July 1942, A.L. Melander, 1♂ 1♀; Sharp Park, 22 June 1947, A.L. Melander, 2♂; Ventura, Rincon Beach, 28 August 1945, A.L. Melander, 1♂. Washington: Ilwaco, 12 July 1922, A.L. Melander, 7♂ 2♀; Ilwaco Beach, 17 July, year ?, A.L. Melander, 1♂; Ilwaco Beach, July 1917, A.L. Melander, 1♂; Seaview, 1 Sept. 1920, Miner, 1♂. Paratypes in USNM and CNC.

Variation: Some variation exists in the degree of prognathism and in the middle legs, in which the yellow color may extend to the 3rd tarsal segment but is usually limited to the 1st and 2nd segments.

Remarks: The larger size and greater prognathism of this species make it easy to separate from *milichioides* and *steyskali*. For positive identification, the male genitalia should be examined as little or no variation was found in these structures.

This species is named for Dr. F. Eugene Wood of the Department of Entomology, University of Maryland, in gratitude for his help in the past and present without which this study would not have been possible.

Tethina steyskali Foster, new species

fig. 4, 7, 10

Male: Length: Body 1.8 mm (1.4–2.2 mm); wing 1.5 mm.

As in *milichioides* group description except:

Head: 1.04 longer than high; antenna dark with gray pollin; 2nd segment with 3 bristles as long as segment; face .49 times eye height; frons gray with brownish tinge centrally; cheek .40 times eye height, anterior $\frac{2}{3}$ white, pollinose; palpus light.

Thorax: Halter yellowish. Legs: Middle and hind tarsi yellow through 2nd segment. Wing: Membrane hyaline.

Abdomen: Male genitalia: Surstylus slightly curved posteriorly; hypandrium with lateral lobes rounded in ventral view, not strongly projecting.

Female: Similar to ♂ except for postabdominal characteristics.

Holotype: ♂, Pismo Beach, California, 29 August 1945, A.L. Melander, coll. No. 73639, USNM.

Paratypes: 33 ♂, 26 ♀, as follows: California: San Simeon, 31 Aug. 1945, Melander, 1 ♂ 2 ♀; Pismo Beach, 29 Aug. 1945, 2 ♂ 3 ♀, 26 July 1940, Melander, 1 ♂; Huntington Beach, 4 June 1945, Melander, 3 ♂; Morro Bay, 16 June 1947, Melander, 1 ♂, 26 Sept. 1946, Melander, 1 ♂, 7 Oct. 1946, Melander, 2 ♀; Morro Dunes, 17 June 1947, Melander, 5 ♂ 4 ♀; Seal Beach, 26 July 1942, Melander, 1 ♂ 1 ♀; Corona del Mar, 25 July 1942, Melander, 1 ♂; Carlesbad, 24 June 1954, Melander, 1 ♂ 1 ♀, 22 June 1950, Melander, 1 ♂; San Clemente, 23 May 1944, Melander, 1 ♂ 1 ♀, 5 June 1945, Melander, 1 ♂; Carpinteria, 28 Aug. 1945, Melander, 3 ♂ 2 ♀, 15 June 1947, Melander, ?; Asilomar, 2–3 Oct. 1946, Melander, 2 ♂ 1 ♀, 1–3 Sept. 1945, Melander, 1 ♂ 2 ♀, 1 Oct. 1946, Melander, 2 ♀, 28 Sept. 1946, Melander, 2 ♀; Pacific Grove, 28 July 1940, Melander, 1 ♂ 2 ♀; San Diego, 3 Aug. 1932, J.M. Aldrich, 3 ♂, 28 June 1917, Aldrich, 1 ♀. Mexico: Baja California, Ensenada, 24 June 1950, Melander, 3 ♂. Paratypes in USNM and CNC.

Variation: As in *woodi*, some variation exists in the extent of prognathism. Most specimens, however, are distinctly more prognathous than specimens of *milichioides*. In the middle legs, as is the case in *woodi*, the yellow color may extend to the 3rd tarsal segment. In the hind legs, some specimens have the 2nd segment also light, the last three being darker.

Remarks: This species can be separated from *milichioides* by its whiter cheek and greater prognathism, and from *woodi* by its smaller size. The male genitalia, however, must be examined before positive identification can be made.

Separation of the females of *steyskali* and *milichioides* is very uncertain. There seems to be no reliable genitalic characters and the variability of the head characters is always present. Female *woodi* are usually much larger than the other two species but overall size too can be variable.

This species is named for Mr. George C. Steyskal, Systematic Entomology Laboratory, USDA, in gratitude for his invaluable suggestions and commentary and his constant source of inspiration for me.

Tethina milichioides (Melander)

fig. 1, 2, 5, 8, 11

milichioides (Melander) 1913:299 (*Rhinoessa*), type-locality, Washington. Lecto-type, male, USNM. Subsequent references: Melander, 1952:198–199 (erects new genus *Phycomyza* for *milichioides*, distribution notes, descriptive notes). Hendel, 1934:48 (in key) (*Rhinoessa*), 48 (citation). Sturtevant, 1923:6 (*Tethina*) (citation).

Male: Length: head + thorax: .96 mm (overall size range: 1.8 mm–2.4 mm); wing: 1.62 mm.

As in *milichioides* group description except:

Head: .86 as long as high; face .40 times eye height; frons yellow anteriorly, becoming slightly darker posteriorly; cheek .40 times eye height.

Thorax: Legs: Mid-tarsus with 1st and 2nd segments yellow, last 3 segments dark; hind tarsus with 1st segment yellow, others darker.

Abdomen: Male genitalia: Surstylus distinctly curved posteriorly; hypandrium with lateral process strong, pointed, projecting posteriorly.

Female: Similar to ♂ except for postabdominal characteristics.

Types: 3 syntypes: Alki Point, Seattle, Washington, August 1908, A.L. Melander, coll. I am designating a male of this series as lectotype. Deposited in USNM.

Material examined: (All collected by A.L. Melander unless otherwise indicated) 154♂, 165♀ as follows: California: Seal Beach: 17 May 1942, 2♀; 26 July 1942, 1♂ 6♀; Carpinteria: 15 June 1947, 1♂ 1♀; 12 June 1953, 3♂; 15 Oct. 1953, 3♂ 1♀; 24 Feb. 1950, 1♂ 1♀; 30 Nov. 1953, 1♀; 8-9 Oct. 1946, 3♂ 1♀; 3 Aug. 1954, 1♀; 28 Aug. 1945, 1♀; 11 Aug. 1950, 2♂; Pacific Grove: 28 July 1940, 3♂ 1♀; 4 July 1921, Sturtevant, 1♂ 2♀; 3 Sept. 1920, Sturtevant, 1♂; Palos Verdes: 15 Oct. 1944, 4♂ 1♀; 15 July 1945, 1♂; Morro Dunes: 6 Sept. 1945, 1♂ 1♀; Rincon: 6 June 1945, 1♂; Rincon Beach: 28 Aug. 1945, 1♀; 23 Feb. 1950, Sturtevant, 2♂; 17 June 1953, Sturtevant, 4♂ 1♀; no date, Sturtevant, 1♂; Carlesbad: 27 Mar. 1946, 1♀; San Clemente: 5 Feb. 1947, 1♀; 13 Oct. 1951, 2♂ 6♀; 5 Oct. 1950, 3♂ 3♀; 21 June 1950, 1♀; 5 June 1945, 9♂ 10♀; 23 May 1944, 9♂ 17♀; 26 Mar. 1946, 3♂ 2♀; 18 Oct. 1944, 10♂ 6♀; 15 Aug. 1949, 1♀; Corona del Mar: 29 June 1942, 3♀; 27 Aug. 1943, 1♂ 3♀; 11 June 1944, 3♂ 1♀; 4 Mar. 1950, Sturtevant, 1♀; 25 Mar. 1946, 3♂ 1♀; 25 July 1942, 4♂ 7♀; 28 Dec. 1944, 3♂ 1♀; 22 May 1944, 10♂ 4♀; 12 June 1948, 1♂ 2♀; 5 June 1945, 1♂ 4♀; 13 Aug. 1949, 3♂; Morro Bay: 9 Aug. 1950, 2♀; 16 June 1947, 2♀; 17-mile Drive: 1 Aug. 1954, 3♂; San Simeon: 31 Aug. 1945, 3♂ 1♀; Balboa: 13 July 1940, 7♂ 8♀; Laguna Beach: 18 July 1943, 3♂ 1♀; 22-23 May 1944, 2♂ 1♀; 5 June 1945, 3♂; 16 July 1945, 3♂ 2♀; 25 Mar. 1946, 1♀; 15 Aug. 1949, 1♂ 3♀; 3 May 1947, 1♀; 11 June 1944, 1♀; 25 Mar. 1953, Sturtevant, 1♂ 2♀; 22 May 1944, 1♀; 18 Aug. 1943, 1♂ 1♀; 15 May 1946, 1♂; Huntington Beach: 4 June 1945, 3♂ 3♀; Pismo Beach: 29 Aug. 1945, 1♂ 1♀; Pismo: 26 July 1940, 4♂ 2♀; Asilomar: 28 Sept. 1946, 1♂ 2♀; 1 Sept. 1945, 2♂ 2♀; 3 Sept. 1945, 1♂; 4 Aug. 1950, 1♀; San Diego: 3 Aug. 1932, J.M. Aldrich, 1♂ 13♀; 28 June 1917, Aldrich, 1♂; Long Beach: 4 Aug. 1911, 5♀; Pescadero: 16 Aug. 1951, 1♀; S. of Pescadero: 16 Aug. 1951, 1♂ 1♀; (Meadeno): 17 Aug. 1951, 1♀; Dana Pt.: 25 Mar. 1953, Sturtevant, 1♀; La Jolla: 28 Mar. 1946, 1♀. Washington: Orcas Isl., North Beach: 19 Aug. 1925, 5♂. Oregon: Waldport: 13 Sept. 1934, 3♂ 4♀; 3 mi. SE Pistol R.: 28 June 1972, Steyskal, 2♂; Neskowin: 31 Aug. year ?, 1♂ 1♀.

Variation: As in *woodi*.

Remarks: See under *steyskali*.

Genus *Neopelomyia* Hendel

Neopelomyia Hendel 1917:46, type-species, *Tethina rostrata* (Hendel) (original designation). Subsequent references: Melander, 1952:192 (in generic key). Hendel, 1934:38 (in key).

General appearance: small, gray-brown, entirely pollinose flies.

Head: Vibrissal angle projecting; arista dark, slightly longer than antenna, short pubescent; 3rd segment rounded, short pubescent; 2nd segment less than $\frac{1}{2}$ length of 3rd; 1st segment shorter than 2nd, both segments with short dorsoapical bristle and short pubescence; face concave with weak median carina; epistomal knob indistinct; frons brown, slightly sunken, pollinose, sides convergent so that at vertex about twice width at base of antenna, center with indistinct pair of convergent hairs; ocellar triangle and occiput gray pollinose; orbits with outer row of 3 strong bristles, posterior longest, middle slightly shorter, anterior about $\frac{1}{2}$ as long as middle bristle, inner orbital row composed of 4–5 short, indistinct hairs; ocellars strong, divergent-proclinate, with pair of short hairs between; inner verticals strong, convergent; outer verticals strong, divergent; postverticals short, convergent; cheek $\frac{1}{3}$ eye height, pollinose, light brown on anterior $\frac{2}{3}$, posterior $\frac{1}{3}$ concolorous with occiput, with many scattered short, black hairs; oral vibrissa distinct; eye oval, oblique, anterior facets larger than others; palpus yellowish, remaining mouthparts dark brown.

Thorax: Gray pollinose. Bristles: Dorsocentrals 4 pairs, presutural 1, postsutural 3 pairs; acrostichals 2 rows, short; humeral 1 with several additional hairs; presutural 1; supraalar 1; postalar 2; intraalar field with 2 or 3 irregular rows of inconspicuous hairs; scutellar 2 pairs, posterior stronger than laterals; propleural 2, short, above anterior coxa; notopleural 2; mesopleural 1, with several finer hairs on posterior $\frac{1}{3}$ of pleuron; sternopleural 1, strong, near postero-dorsal corner, and several shorter hairs; pteropleural bristles absent; all other pleural surfaces bare. Halter light. Legs: Gray pollinose, except hind femur polished posteriorly, hairy, tarsi dark. Wing: Hyaline, faintly smoky; costa broken at end of subcosta.

Abdomen: Gray pollinose; terga with scattered hairs. Male genitalia: Epandrium an inverted U-shaped capsule with ventral process on each side; surstylus not fused with epandrium, base located near base of cercus, mesal surface bristly; ventral process with few stout bristles mesally; hypandrium 2-armed with distiphallus issuing from between; inner copulatory apparatus as in fig. 12, 13 and in discussion; distiphallus simple, long, pointed, dorsal surface hairy. (See further discussion of male genitalia below).

Discussion: *Neopelomyia* Hendel can be distinguished from other tethinids by the protruding vibrissal angle and the bristly cheek. The following characters of phylogenetic importance in the basic ground-plan of the group should be noted: Vibrissal angle projecting (apomorphic); elongated labellum (apo-); strictly halophilic in habitat (apo-); 3 pairs of orbitals (plesiomorphic); wide face (plesio-); acrostichals normal (not reduced) (plesio-). The projecting vibrissal angle, elongated labellum, and halophilic habitat are the autapomorphic character states which demonstrate the monophyly of the group and separate it from its sister-group *Pelomyia* + *Pelomyiella*.

The two known species of *Neopelomyia* are restricted to the west coast beaches of North America. They can be collected on "newly stranded algae in association with *Phycomyza milichioides*" (Melander, 1952).

CHARACTERS OF THE MALE POSTABDOMEN OF *Neopelomyia*

The structure of the male postabdomen of *Neopelomyia*, as in other tethinid genera, is simple relative to many other acalyptrate groups. It basically consists of a simple epandrium with its surstyli and a 2-armed hypandrium with its associated structures.

Epandrium and Associated Structures (fig. 14, 15): The epandrium is an inverted U-shaped structure with several strong bristles on the lateral and dorsal surfaces. The cerci are connected posteriorly near the dorsum of this structure and these are simple, pubescent-hairy lobes which are separated from each other. The surstyli, as in the other Pelomyiinae are located just laterad to each cercus and articulate with the interparameral sclerite at their inner dorsal corner. They are not fused with the epandrium and are short decumbent structures with several short, stout, bristles on their mesal surface. The fact that there is no fusion between the surstyli and the epandrium can be demonstrated physically as well as visually. When the hypandrium and interparameral sclerite are pulled away from the epandrium, the surstyli accompany the interparameral sclerite leaving the epandrium undisturbed with no evidence of tearing.

The epandrium extends ventrally into 2 ventral processes, completing the arms of the U shape. The ventral processes are spatulate in shape, pubescent, and each has several short, stout, bristles on the mesal surface.

The interparameral sclerite is in the form of a stylized H connecting the surstyli with the hypandrium. The point of articulation of the interparameral sclerite with hypandrium is located slightly posterior to the point of articulation of the hypandrium and epandrium.

Hypandrium: The hypandrium seen in ventral view (fig. 16) is a simple structure formed by 2 arms fused anteriorly. The dorsal edge of this anterior fusion is fused with the aedeagal apodeme.

Aedeagus and Inner Copulatory Apparatus (fig. 12, 13): As seen in the figures, the inner copulatory apparatus is composed of a heart shaped "scaly"-surfaced epiphallus surrounded by a membranous sac. The dorsal surface of the epiphallus contains a partially sclerotized ring (the epipallic ring) which articulates with the posterior edge of the aedeagal apodeme. Also present are 2 postgonites articulating with the aedeagal apodeme anteriorly and fusing with the "scaly" portion of the epiphallus posteriorly. Both the postgonites and the aedeagal apodeme are heavily sclerotized. The postgonites in lateral view are quite parallel with the apodeme, unlike the *Tethina milichioides* group previously discussed.

The aedeagal apodeme itself is a long, rodlike structure which is free in the body cavity.

The distiphallus is simply a long, slender rodlike structure with long dense hairs on the dorsal surface extending about $\frac{1}{2}$ of the distance from the base to the pointed tip. The distiphallus articulates with the epiphallic ring basally. At the posterior tip of the epiphallus are 2 non-sclerotized lobes which, I believe, are the "partially sclerotized spatulate structures" which were discussed previously in the *milichioides* group.

KEY TO THE SPECIES OF *NEOPELOMYIA* HENDEL

1. Cercus of male longer than surstylus; ventral process of epandrium as in fig. 15 *N. longicerca* new species

- Cercus of male shorter than surstylus; ventral process of epandrium as in fig. 14 *N. rostrata* (Hendel)

Neopelomyia longicerca Foster, new species

Male: Length: body 1.5 mm (1.5 mm–2.2 mm); wing: 1.5 mm.

As in genus description except:

Head: face .72 length of frons; frons light brown except near base of antenna which is concolorous with face; cheek about $\frac{1}{3}$ eye height.

Abdomen: Male genitalia as in fig. 15; cercus much longer than surstylus; ventral process of epandrium with anterior edge not strongly curved.

Female: Similar to ♂ except for postabdominal characteristics.

Holotype: ♂, California, Laguna Beach, 5 June 1945, A.L. Melander, coll. No. 73641, USNM.

Paratypes: 15 ♂ as follows: California: Laguna Beach: 25 Jan. 1935, Melander, 3; 22 May 1944, Melander, 1; 18 July 1943, Melander, 1; Corona del Mar: 22 May 1944, Melander, 2; 29 June 1942, Melander, 2; 25 Mar. 1946, Melander, 1; Carpinteria: 11 Aug. 1950, Melander, 1; Pt. Arguello: 23 Aug. 1962, R.R. Sanders, 1; Morro Bay: 24 Feb. 1950, Sturtevant, 2; La Jolla: 29 Dec. 1934, Melander, 1. Paratypes deposited in USNM and CNC.

Discussion: This species can easily be distinguished from *N. rostrata* by the longer cercus of the male and the shape of the ventral process of the epandrium. I have not found reliable diagnostic characters to separate the females of the two species.

Neopelomyia rostrata (Hendel)
fig. 12–14, 16

rostrata (Hendel) 1911:41, fig. 3 (head), type-locality, British Columbia. Subsequent references: Malloch, 1913:147, fig. 28 (*Tethina*). Melander, 1913:297 (*Tethina*) (in key); 1952:190 (*Neopelomyia*) (biology), 198 (distrib. rec., compared to *Tethina milichioides*.) Saunders, 1928:545 (*Tethina*) (biology). Sturtevant, 1923:7 (list). Hennig, 1936:139 (systematic notes). Hendel, 1934:38 (in key), 53–54 (citation).

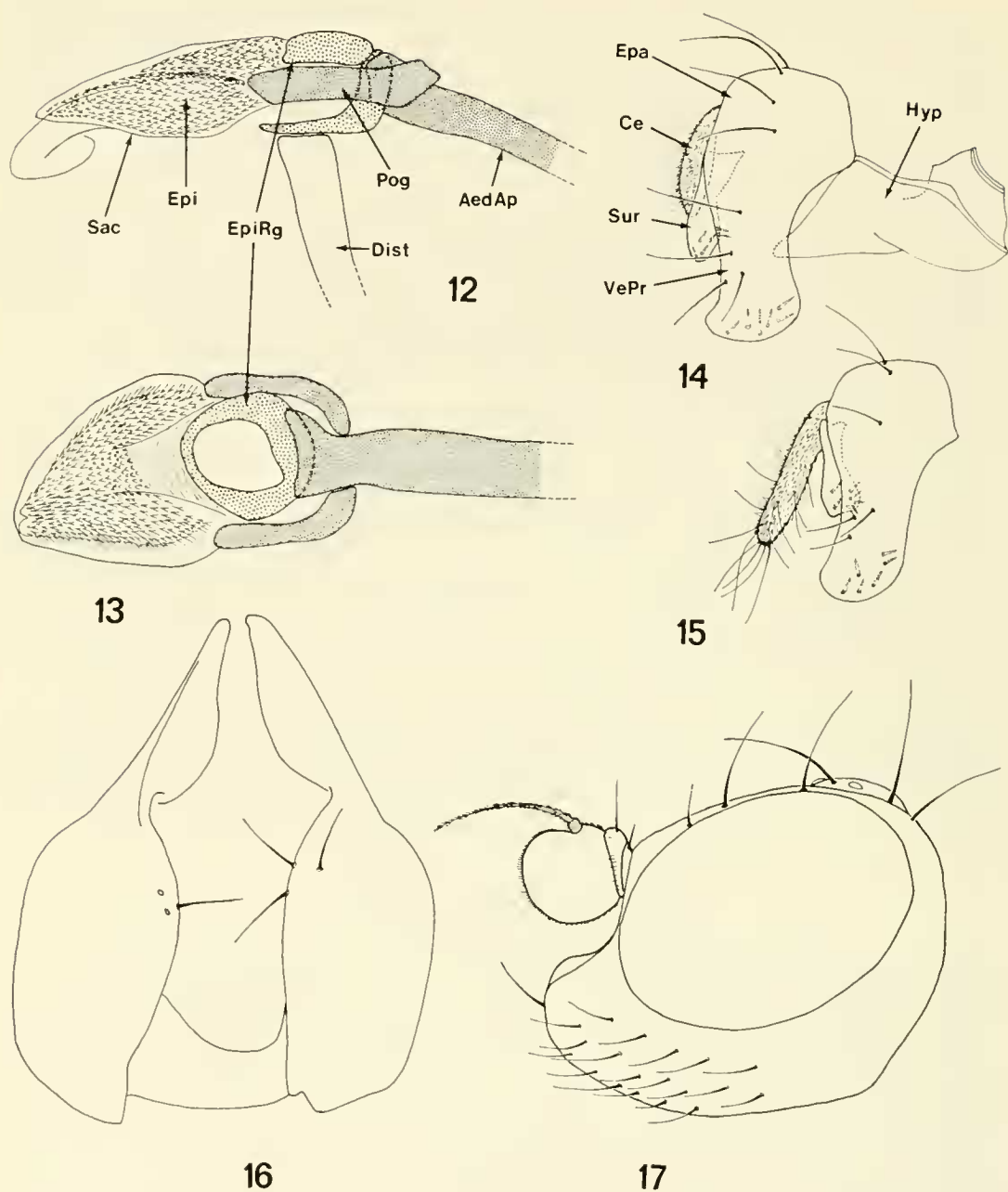
Male: Length: Body 2.0 mm (1.4mm–2.4mm); wing: 1.7 mm.

Similar to *N. longicerca* except:

Slightly darker coloration; male cercus shorter than surstylus; ventral process of epandrium with anterior edge strongly curved (fig. 14).

Types: 5 syntypes, Canada, British Columbia, Pender Island, 25 July 1905, J.R. Aldrich, coll.? I have seen 2 of the 5 syntypes and am designating a male as lectotype. Deposited in Naturhistorisches Museum, Vienna.

Material examined: 109 ♂, 90 ♀ as follows (all deposited in USNM unless otherwise indicated): California: Point Lobos: 7–8 Aug. 1969, B. Hocking, 2 ♀, CNC; Pacific Grove: 3 Aug. 1969, Hocking, 1 ♀, CNC; 28 July 1940, Melander, 6 ♂ 6 ♀; Monterey: 25 Sept. 1934, Melander, 10 ♂ 7 ♀; Pismo Beach:



Figs. 12-13. Male inner copulatory apparatus of *Neopelomyia rostrata*. 12, lateral view. 13, dorsal view. Fig. 14-15. Lateral view of external male genitalia. 14, *N. rostrata*. 15, *N. longicerca*, hypandrium not shown. Fig. 16. Ventral view of hypandrium of *N. rostrata*. Fig. 17. Lateral view of head of *N. longicerca* (head of *N. rostrata* is identical).

26 Sept. 1934, Melander, 1 ♂; Pismo: 26 July 1940, Melander, 2 ♂ 1 ♀; Laguna Beach: 25 Jan. 1935, Melander, 9 ♂; 24 Oct. 1951, Melander, 1 ♀; 25 Mar. 1953, Sturtevant, 1 ♀; Corona del Mar: 29 June 1942, Melander, 2 ♂ 1 ♀; 13 Aug. 1949, Melander, 1 ♂; 28 Dec. 1944, Melander, 1 ♀; 24 Feb. 1912, Sturtevant, 1 ♀; Palos Verdes: 15 Oct. 1944, Melander, 1 ♂; Morro Bay: 24 Feb. 1950, Sturtevant, 5 ♂ 1 ♀; 18.5 mi. N. Crescent City: 28 June 1972, Steyskal, 1 ♂; Moss

Beach: Intertidal rocks, 21 Mar. 1948, Wirth, 2♂; Golera: 28 Mar. 1955, Sturtevant, 1♂ 2♀; La Jolla: 29 Dec. 1934, Melander, 1♂; 22 June 1950, Melander, 1♀; Dry Lagoon Beach St. Pk.: 10 Aug. 1953, Arnaud, 4♂ 2♀, Cal. Acad. Sci.: Asilomar: 1-2 Sept. 1945, Melander, 2♀; Seal Beach: 26 July 1942, Melander, 1♀; Carpinteria: 8 Oct. 1946, Melander, 1♀. Washington: Ilwaco Beach: 17 July, year ?, Melander, 16♂ 12♀; 6 Sept. 1934, Melander, 1♂; 12 July 1922, Melander, 7♂ 13♀; Sequim: 25 Aug. 1951, Sturtevant, 1♂; Roche Harbor: 3 July 1909, collector?, 1♂; Shelton, Walkers Park: 21 July 1919, Melander, 3♀; Kanaka Bay: 8 July 1924, Melander, 1♀. Canada, British Columbia: Queen Charlotte City, Q.C.I., flowers of *Ranunculus* on foreshore: 9 July 1960, Shewell, 6♂ 5♀, CNC; Queen Charlotte City, on kelp on beach: 9 July 1960, Shewell, 15♂, CNC; Terrace (doubtful): 19 July 1960, C. H. Mann, 1♂, CNC; Departure Bay: 3 July 1927, collector, 1♂ 1♀, CNC; 30 June 1927, coll.?, 1♂ 1♀, CNC; Port Edward: 18 July 1960, Mann, 1♂, CNC; Port Grey, Vancouver: 9 July 1973, Vockeroth, 1♂ 2♀, CNC; Jct. Pr. Rupert-Port Edward Hwy: 18 July 1960, Mann, 4♀, CNC; Pender Id.: 25 July 1905, Aldrich, 1♀; Mill Bay: 12 July 1924, Melander, 4♂ 1♀; Butchart: 11 July 1924, Melander, 5♂ 6♀; B.C. Bio. Sta. Departure Bay: 14 July 1927, coll.?, 1♂ 2♀; Departure Bay: 30 June 1927, coll.?, 1♀.

Discussion: A substantial amount of variation exists in the degree of prognathism of the head, some specimens being much less prognathous than others. These differences do not, however, have corresponding differences in the male genitalia or any other major character complex so I do not consider them to be of specific importance.

Abbreviations used in figures: AedAp, aedeagal apodeme; ApPl, apodeme plate; Ce, cercus; Dist, distiphallus; Epa, epandrium; Epi, epiphallus; EpiRg, epiphallic ring; Hyp, hypandrium; LtLb, lateral lobe of hypandrium; Pog, postgonite; Sac, membranous sac around epiphallus; Sur, surstylus; VePr, ventral process of epandrium.

Dark, light, and no stippling indicate heavy, light, and no sclerotization, respectively.

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